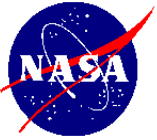




NASA STRATEGY FOR RISK ASSESSMENT

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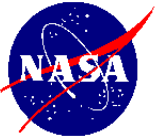
OUTLINE

- **Objective**
- **Motivation**
- **Best PRA Values**
- **Current Status at NASA**
- **Needs and Approaches**
- **Organizing the Effort**
- **On-Going and Planned Activities**
- **Key Elements for Success**



OBJECTIVE

Develop a **world-class in-house capability** to perform, manage, and use Probabilistic Risk Assessment (PRA) methods at NASA



MOTIVATION

In modern technological applications, PRA has proven to be a systematic, logical, and comprehensive tool to assess risk (likelihood of unwanted consequences) for the purpose of:

- Increasing safety in design and operation
- Saving money in design, manufacturing or assembly and operation



NECESSITY OF PRA

At NASA, PRA is necessary (N) and/or appropriate (A)
for:

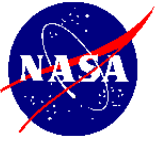
	<u>N</u>	<u>A</u>
– Obtaining Presidential approval for launch of certain quantities of nuclear materials (e.g. Galileo, Ulysses, Cassini)	X	X
– Analytically demonstrating satisfaction of planetary protection requirements (e.g., Mars Sample Return)	X	X
– Supporting decision making for design and modification of space systems (e.g., Space Shuttle, ISS, CRV)		X

In fact, NASA has performed, is performing, or intends to perform
PRA for most of the preceding examples



PRIMARY PURPOSE OF NASA HQ PRA EFFORTS

- The primary purpose is to assure that if and when NASA does perform PRA, we do it properly and produce a quality product that we understand and know how to use.
- The primary purpose is not to “sell” PRA or demand PRA.



PRA IS OF MOST VALUE WHEN WE HAVE

- In-house expertise to perform and manage PRAs
- In-house ownership and corporate memory of PRA methods, tools, databases, and results
- Lowest dependence on outside consultants to perform and manage PRAs and to control databases and computer tools



CURRENT STATUS AT NASA

- Experience with traditional FMEA
- Some experience with FTA
- Great overall interest in and management support for performing PRA
- Scarce and scattered PRA resources
- Inadequate communication/cooperation on PRA among centers
- No corporate memory on PRA work/data



NEEDS AND APPROACHES

- Integrate and coordinate PRA efforts throughout NASA
 - Develop and implement NASA PRA policy
 - Coordinate needs for and use of technical assistance from other centers, HQ, consultants
 - Retain decentralization of PRA project management and performance but **centralize the PRA *process* NASA-wide**



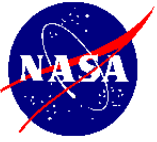
NEEDS AND APPROACHES

- Skilled in-house personnel resources
 - Train (classroom and on-the-job)
 - Strategic hires
 - Temporary transfers from other Government organizations
 - Use of loaned/seconed experts from industry/university
 - Consultants to transfer technology, complement resources and for specialized analyses



NEEDS AND APPROACHES

- NASA-wide baseline PRA procedures, standards and tools
 - Develop PRA standards and procedures guide to perform PRA for aerospace applications
 - Adopt “baseline” state-of-the-art PRA computer tools (e.g., government developed SAPHIRE)
 - Develop other state-of-the-art NASA PRA computer tools (e.g., QRAS, Dynamic fault tree analysis tool)



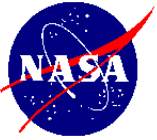
NEEDS AND APPROACHES

- Coordinate and maintain PRA databases for NASA application categories
 - Design engineering information
 - Component and system reliability
 - Maintenance, test and repair data
 - Initiating events lists and frequencies



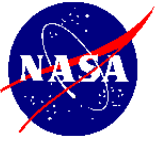
NEEDS AND APPROACHES

- NASA infrastructure to effectively use limited-size cadre of in-house PRA experts
 - NASA-wide awareness of where the PRA resources, knowledge and data are
 - Regular inter-center communication, and sharing of people, tools, data, lessons learned
 - Environment for synergistic NASA-wide cooperation in PRA efforts



ORGANIZING THE EFFORT

- NASA HQ to:
 - Organize/conduct/coordinate awareness and practitioner PRA training
 - Develop PRA standards, requirements, procedures, guidelines
 - Mentor and provide specialized assistance
 - Coordinate use of PRA computer tools
 - Coordinate use of outside consultants
 - Manage the PRA *process*, oversee quality



ORGANIZING THE EFFORT

- Expert PRA Groups, one at each center, to
 - Disseminate PRA information throughout NASA
 - Help projects organize, staff, perform, manage PRA efforts at the center
 - Assist/perform training
 - Assist other centers on as-needed basis
 - Serve as local custodians of PRA software, data
 - Work with HQ, support NASA PRA strategy



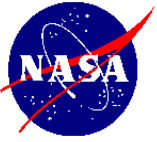
ON-GOING AND PLANNED ACTIVITIES

- PRA strategy development - **summary here**
- Develop awareness and practitioner training for HQ, Centers, APPL - **one completed**
- Develop requirements for state-of-the-art computer programs - **task initiated**
- Develop PRA Procedures Guide for aerospace applications - **outline reviewed**



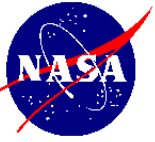
ON-GOING AND PLANNED ACTIVITIES

- Cooperation with other Government agencies - June 27, 2000 meeting with NRC
- Acquire SAPHIRE code and arrange training for it - June 20-23, Aug. 15-18, +
- Evaluate/incorporate QRAS improvements
- Collect information on past/present/future PRA efforts (people, tools, data, projects, consultants)



ON-GOING AND PLANNED ACTIVITIES

- Organize one-day kick-off meeting for NASA-wide PRA information sharing
- Develop mechanisms to maintain NASA-wide PRA information exchange (telecons, meetings, conferences, working groups)
- Develop/organize seminars/workshops on PRA and risk management use in NASA management decisionmaking



KEY ELEMENTS FOR SUCCESS

- **NASA-wide PRA policy and procedures**
(e.g. NPD)
 - **Standardization** of “baseline” PRA methods, programs, procedures, data collection
- **NASA-wide PRA integration and coordination**
 - **Coordination** through HQ of PRA projects, PRA training and use of PRA consultants
 - **Monitoring and control** of the *PRA process and PRA quality*